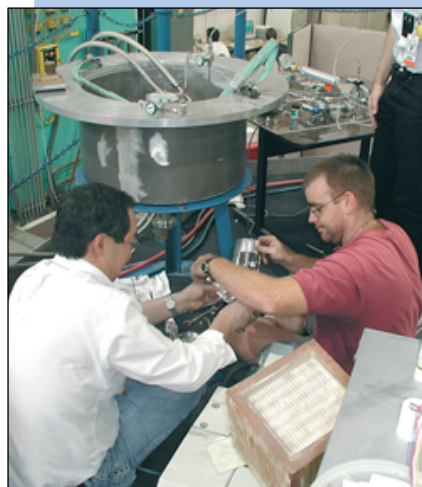


# Neutron Powder Diffractometer (NPD)

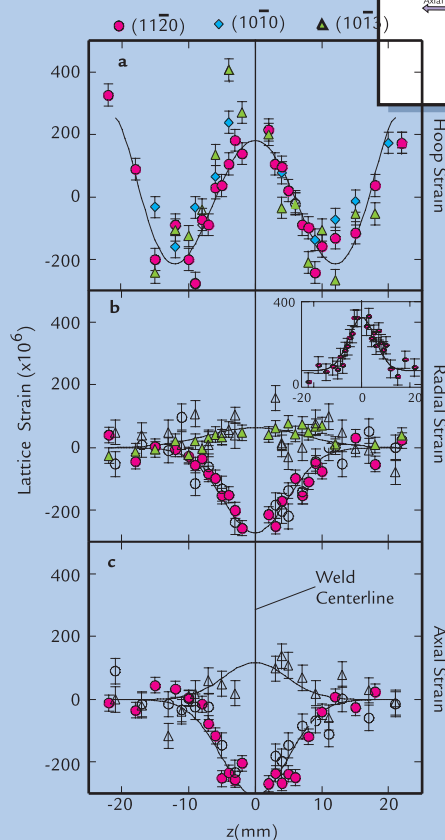
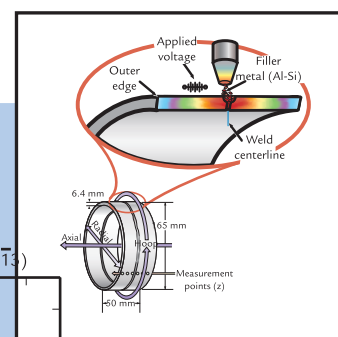
The Neutron Powder Diffractometer (NPD) is a high-resolution powder diffractometer located 32 m away from the spallation target. The instrument can be used for a number of applications: high-resolution crystallography is a powerful tool in determining complex structures; total scattering measurements give an insight into the local structure of functional materials; and neutron diffraction is the key to the measurement of residual strains in bulk materials. The standard collimation produces a 50 x 10 mm beam at the sample position. For strain measurements, a set of radial collimators defines the diffracted beam volume, and a focusing optic is available to increase the beam intensity when sampling small volumes. Four detector banks (each have 31  $^3\text{He}$  30-cm tubes) sit symmetrically about the sample position at  $\pm 90^\circ$  and  $\pm 148^\circ$ , covering a d-spacing range of 0.25 to 4 Å. The resolution in the backscattering detectors is  $\Delta d/d = 0.15\%$ , and at  $90^\circ$  it is 0.25%. An upgrade NPD diffractometer is underway in partnership with the National Science Foundation, the University of Pennsylvania, and other academic institutions. With this upgrade, NPD will provide unique capability, making it possible to perform simultaneous Rietveld analysis and analysis of atomic pair-density functions. The upgrade is scheduled for 2002 and will add 168  $^3\text{He}$  position-sensitive detectors to the backscattering region of the instrument.

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Don Brown and a visiting user work on installing new parts to NPD.



(a) Hoop, (b) radial, and (c) axial directions of the lattice-specific strain are plotted as a function of distance from the weld centerline. Closed and open symbols represent data taken on the reactor and spallation sources, respectively. The solid lines are guides for the eye. Data was taken on NPD.

NPD Specifications		
detector banks	d-spacing range (approximate)	resolution
+/- 90°	0.35-4.2 Å	0.25%
+/- 148°	0.25-3.1 Å	0.15%
Moderator	Chilled water at 283 K	
Sample environment	10-300 K; closed-cycle refrigerator; stress rig; uniaxial tension on compressor (+/- 50 kN, RT > 300°C); controlled atmosphere furnace (RT > 1400°C); vacuum furnace (RT > 700°C); manipulation and radial collimation system > 1 > 64 mm <sup>3</sup> (sampling volume)	
Maximum beam size at sample	5.0 cm in height x 1 cm in diameter	
Experiment duration	4 to 48 hours	